

COASTAL HERITAGE

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A sepia-toned photograph of a man standing on a porch, gesturing with his hands. He is wearing a white t-shirt, jeans, and sneakers. The street in front of him is covered in debris, including corrugated metal, wood, and other trash. In the background, another person is walking away, and several cars are parked along the street. The sky is cloudy.

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ON THE COVER: Near downtown New Orleans, Malcolm Russell stands outside his Katrina-damaged house. Although he'd purchased flood insurance, the settlement wasn't large enough for him to finish needed repairs. PHOTO/WADE SPEES



MOLD ATTACK.

Mold marks the extent of Katrina's floodwaters in Lahoussine Belanouane's home in New Orleans' largely deserted Lower Ninth Ward. When he bought this house, his mortgage lender said he didn't need flood insurance.

PHOTO/WADE SPEES



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Subscriptions are free upon request by contacting:

S.C. Sea Grant Consortium
287 Meeting Street
Charleston, S.C. 29401
phone: (843) 727-2078
e-mail: Annette.Dunmeyer@scseagrant.org

Executive Director
M. Richard DeVoe

Director of Communications
Susan Ferris Hill

Editor
John H. Tibbetts

Art Director
Carl Turner



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After the Storm

By John H. Tibbetts

LOWER NINTH WOES. Months after Katrina flooded New Orleans, Lahoussine Belanouane ponders his future. Lacking flood insurance, he doesn't know if he can afford to rebuild his home in the Lower Ninth Ward. PHOTO/WADE SPEES

Lahoussine Belanouane, a cabdriver and entrepreneur, owns a house in the Holy Cross neighborhood of the Lower Ninth Ward in New Orleans. Hurricane Katrina's storm surge dumped seven feet of water into his home, but like many other Gulf Coast property owners, he didn't have flood insurance. "I wanted to buy flood insurance, but my insurer said, 'You don't need it,'" says Belanouane. "They said, 'This house is not in a flood zone. It has been here for many years and it's never been flooded.'"

In Louisiana and Mississippi, 112,000 owner-occupied homes swamped by Katrina or Rita stood outside official flood zones and weren't covered by flood insurance. Numerous homeowners reportedly had been told that they weren't at risk of high water. The result, of course, is financial devastation.

Take heed, coastal South Carolinians. If you live in a flood-hazard zone, buy flood insurance. Even if you think you live on higher land, consider buying it anyway.

"In New Orleans and Mississippi, a lot of people who got flooded were actually located on land higher than the official flood-hazard areas," says Lisa Jones, South Carolina Department of Natural Resources floodplain manager for the state.

Donna Maselli, a real-estate lawyer, and her husband had renovated their New Orleans home on a ridge in one of the city's oldest neighborhoods. Five feet of water festered on her first floor for two weeks.

"I certainly knew about flood insurance," says Maselli. "When I was doing a (real-estate) closing, the lender was always the first one to tell me to make sure the buyers have flood insurance. With that background, I bought a house in the highest flood zone in Orleans Parish. We were not required by our lender to have flood insurance, and I argued with her a little bit, but she said, 'It never floods out here.' And I said, 'Fine.'" Maselli expects that her homeowners' policy will not cover her claim for flood damages as she renovates her home again. "We have a lot of debt now."

WHAT COMMUNITIES CAN DO

The 2005 hurricane season showed that some coastal states lack strong building codes and comprehensive land-use planning requirements.

In 2000, Congress tried to address this problem by passing the Disaster Mitigation Act. The law requires communities to create hazard-mitigation plans before they can receive certain federal disaster grants to aid in rebuilding. Communities are supposed to discover their most vulnerable areas and study how to rebuild more wisely after disasters before they can get federal help.

Now many battered Gulf Coast communities are scrambling to create hazard-mitigation plans. This rule could slow reconstruction, but it could also ensure stronger buildings and better land-use planning.

"It's a good requirement because it makes communities think about what their risks are, though it can also be overwhelming for them," says Jacky Bell, a FEMA hazard-mitigation specialist. FEMA is providing technical assistance, sending planners to the coast.

But to fulfill the new rule, communities can provide a superficial checklist of hazards and mitigation techniques, says Raymond Burby of the University of North Carolina at Chapel Hill. Instead, localities should establish an effective comprehensive plan with a hazards component.

Much of the damage from recent hurricanes, says Burby, could have been avoided if more Gulf states had established tough building codes and had required localities to create comprehensive plans to manage development. South Carolina has enacted a tough statewide building code and a comprehensive-planning requirement for localities.

The federal government should require that states and localities plan for the future, says Burby. "It's odd, I think, that the federal government has strong incentives for development of hazardous areas. But it has not had equally strong incentives for local governments to manage that development responsibly so they don't create catastrophic conditions."

There were many reasons why Gulf Coast homeowners were underinsured. Some Katrina victims apparently knew they lived in flood zones but never bought flood policies; others got policies but then let them lapse. "A lot of people don't buy flood insurance because they believe they have the federal government as a backstop," says Jerry Johns, president of the Southwestern Insurance Information Service, Inc., a trade organization based in Austin, Texas.

Many were hard-working people who, worried about paying rent or buying groceries, didn't view paying flood premiums as a top priority. The average premium is about \$400 a year for a \$100,000 policy.

Some Gulf Coast homeowners believed that because they were living outside of an official floodplain, they couldn't get wet from rising water. But they were wrong.

In fact, Katrina's surge drove water far beyond the official 100-year coastal floodplain. Katrina drowned neighborhoods that hadn't been swamped by a hurricane in anyone's memory, not even by Camille, a category 5 storm that struck the Mississippi coast in 1969. Katrina surged up rivers and creeks as far as 22 miles inland.

It's probable that some Gulf Coast victims belatedly realized how insurance policies are structured. That is, if a storm's wind tears off your roof or breaks your windows and rain pours into your house, then you can file a claim under a standard homeowners' policy. But if water rises from below—a storm surge, a river flood, or a broken levee—that's another matter. Your homeowners' insurance, regulated by state governments, will not pay out. Only federal flood insurance covers rising water.

Since the 1920s, private companies have avoided writing policies against floods, which are unpredictable yet alarmingly common and expensive. Since 1968, the federal government has offered Americans a chance to protect the value of their homes and businesses from flood damage. The

Federal Emergency Management Agency (FEMA) manages this supplementary insurance through the National Flood Insurance Program.

How do you know whether your property is located in a flood-hazard zone? Your insurer and your local building official rely on FEMA maps, which delineate the locations of "100-year floodplains"—the places with a one-percent chance in any year of being inundated. To locate this hazard zone, researchers use computer models that crunch information about land elevation, drainage patterns, and hurricane surges. Along coastlines, the 100-year floodplain is typically close to places where a category 3 hurricane's surge is likeliest to reach.

You are required to purchase flood insurance if you meet two conditions. First, according to FEMA maps, you own a structure within the flood-hazard zone of more than 20,000 communities participating in the flood-insurance program. Second, you have a mortgage from federally regulated banks or the Federal Housing Administration.

But unregulated lenders issue about 40 percent of mortgages. And people who own their homes outright and do not have mortgages are not required to have flood insurance.

Finally, homeowners, lenders, and private insurers were misinformed about flood dangers. Many New Orleans-area homes were certified as being outside the 100-year floodplain, although they were actually below sea level. FEMA had certified that levees would protect structures from floods caused by a category 3 hurricane like Katrina.

J. Robert Hunter, director of insurance for the Consumer Federation of America, says he's heard numerous complaints about insurance agents telling homeowners that they didn't need flood insurance. "Even some banks told them that. People were getting the information that they had no risk, which is obviously not a true statement. In addition, a lot of people who thought they were outside

the floodplain were really inside the floodplain” because FEMA maps were antiquated. “FEMA should have kept their maps up-to-date,” says Hunter, who managed the federal flood-insurance program during the mid-1970s.

When Katrina struck, coastal Mississippi flood maps were 20 years old, last revised in 1985 or 1986, according to Mary Hudak, a FEMA spokesperson.

Researchers calculate coastal flood-hazard zones by analyzing every storm surge that occurred in a particular region throughout the historical record. Mississippi’s coastal maps did not account for several hurricanes

that struck the Gulf Coast during the early 1990s.

“Updating the maps frequently is important because as additional data become available, they can change” the coastal flood-hazard zones, says Larry Olinger, president of the Association of State Floodplain Managers Foundation, a nonprofit organization based in Madison, Wisconsin.

Stale flood maps are commonplace nationwide. “The current (FEMA) maps are paper-based, outdated, inaccurate, and inadequate,” noted Inspector General

Richard L. Skinner of the Department of Homeland Security, which oversees FEMA, in a Dec. 2005 report.

As a result, many coastal buildings in the United States could be more flood-prone than property owners realize.

Almost half of South Carolina’s FEMA maps are 11 years old or older, says Lisa Jones, the state floodplain manager. Georgetown County’s maps were last fully updated in 1989. Charleston County’s maps, by contrast, were updated in 1982, 1992, and again in 2004, according to Carl Simmons, county building official.

BEYOND PRESERVATION. *“My poor city,” said New Orleans native and preservationist Stephanie Bruno, shown inspecting a house that Hurricane Katrina pushed 12 feet off its foundation. PHOTO/WADE SPEES*



He points out, however, that many older maps can be quite accurate and that Charleston County's surge zone actually changed little from 1992 to 2004.

For years, FEMA complained of inadequate funding for mapping. Then, in 2003, Congress provided \$1.5 billion for this effort, and the following year FEMA announced a five-year program to create digital maps of the nation's low-lying areas. The new maps will be completed in 2009, potentially changing the configuration of flood-hazard areas.

FEMA has created 228 interim flood-hazard maps for the 110-mile Mississippi coast. Louisiana's interim maps will be released sometime this year. But it will take at least another year for FEMA to confirm the maps' accuracy by running computer models with the latest storm data, and to complete the required public notice and review process.

In the meantime, each local government has to decide whether or not to follow FEMA's temporary guidelines. When official maps are finalized, localities will have to abide by the new standards to remain in the flood-insurance program.

FEMA's advisory maps have doubled the size of the 100-year floodplain in Gulfport, Mississippi, which now includes 6,233 houses and other structures, more than twice the previous number. If Gulf Coast property owners follow FEMA's guidelines, many will have to rebuild their structures three to nine feet higher than before, says Olinger.

To rebuild, many victims are waiting for federal disaster aid, but their best hopes will likely be dashed. "People always underestimate the degree of loss they could face from a disaster, and they overestimate the degree to which disaster relief will make them whole again," says Raymond Burby, a professor of urban and regional planning at the University of North Carolina at Chapel Hill.

Congress has set a \$26,200 limit per family for Katrina-related FEMA

disaster grants, which must cover expenses of food, shelter, clothing, medical conditions, plus all home reconstruction. "Twenty-six thousand dollars is a small proportion of the value of a flooded house," Burby points out.

Low-interest loans of up to \$200,000 are available from the Small Business Administration for home reconstruction. Interest rates range from below three percent to slightly more than five percent, depending on whether other credit is available. Nevertheless, 82 percent

RAYMOND BURBY

People always underestimate the degree of loss they could face from a disaster, and they overestimate the degree to which disaster relief will make them whole again.

of loan applicants have been turned down because they did not have high-enough incomes or strong-enough credit ratings to qualify.

In Dec. 2005, Congress allocated \$11.5 billion in new grant money for Gulf Coast hurricane victims, and state officials have said they plan to use a portion of it to compensate families whose homes were flooded by Katrina but did not have flood insurance. Even so, this will probably fall short of what is needed.

Along the Mississippi coast, developers are reportedly rushing in to buy coastal properties where homes and businesses once stood. Meanwhile, thousands of working people might not return to their hometowns because they've lost everything and cannot afford to rebuild.

U.S. Rep. Gene Taylor (D-Miss.) and Sen. Trent Lott (R-Miss.) have proposed legislation that would allow

homeowners who were living outside official flood zones to buy into the flood-insurance program retroactively if they agree to keep the property insured for floods in the future.

That, however, would ruin the program, says Hunter. "You can't buy insurance after the event. Why would I buy flood insurance now? When the next flood happens, then I would go to Congress and say, 'Give me the insurance.' And Congress can't say no, because they just gave it to someone else."

FLOOD CONTROL IN U.S.

To understand the nation's flood-insurance system, consider the history of New Orleans, the city that has reflected U.S. flood policy for generations.

From its beginnings New Orleans was often a wet place. In 1708, French settlers founded New Orleans on a crescent-shaped ridge of high land on a bend of the Mississippi River. By 1727, New Orleans had built a four-foot wall on top of the natural levee for about a mile along the waterfront. Yet the river upstream would pour around the earthen wall, flooding the city on the backside, and high water would occasionally overtop the riverfront levee as well, according to Craig E.

STARTING OVER. Debris in front of this New Orleans home is the result of three days' cleanup after Katrina. Leaders in Louisiana and Mississippi have called on Congress to provide billions of dollars in federal grants to pay owners of heavily damaged homes up to \$150,000 each to elevate, repair, or relocate their structures out of harm's way. Other Gulf Coast states want a share of this federal assistance as well. PHOTO/WADE SPEEDS



Colten, a geographer at Louisiana State University. As the city began expanding from the narrow crescent of high ground into lower elevations, the levees had to be extended again and again.

By 1812, settlers had built levees upstream 130 miles on the east bank to Baton Rouge, and on the west bank 165 miles. After the Civil War and into the 20th century, levee construction and maintenance protected the city and upstream plantations.

Then came a Katrina-like catastrophe of its day—the Great Flood of 1927—when exceptionally heavy spring rains drove up water levels along the lower Mississippi River. Delta levees collapsed, one after another. New Orleans escaped damage only after downstream levees were dynamited, relieving stress on the city's flood protection system.

The Great Flood of 1927 killed 300 people, drove nearly one million from their homes, and captured the nation's attention in much the same way that Katrina did. The 1927 catastrophe, however, failed to raise doubts about engineered solutions as the best way to fight floods. Instead, U.S. policymakers further embraced the principle of diverting or containing water away from places where people lived and worked.

The early 20th century was the heyday of the American engineer. In 1880, there were 7,000 engineers in the United States. By 1930, 226,000 engineers were transforming the nation's industrial and social systems. Engineering societies called for scientific management and rational analysis, reducing waste, increasing efficiency, and establishing standards.

Engineers appeared to offer a superhuman capacity to dominate nature and natural disasters. In 1913, *The Atlantic Monthly* praised “the engineers” who “have swung their souls free . . . like gods.”

In 1928, President Calvin Coolidge signed a flood-control law that began the process of making the federal government responsible for containing the Mississippi River. Amendments to the law over the next decade required

federal agencies to become directly involved in local affairs—that is, to control floods with more extensive structural solutions. The federal government, however, lacked authority over land uses—farms, factories, and towns—protected by the levees.

For the next 70 years, federal funding of construction and maintenance of 2,000 miles of levees—earthen, rock, and concrete walls—along the banks of the Mississippi River and its tributaries have helped keep these waterways straight for navigation and flood control.

This strategy has been successful in the sense that it has prevented flooding along the lower Mississippi River. (During Katrina and Rita, Mississippi River levees did not fail; instead, the floodwalls and levees that collapsed were along Lake Pontchartrain and industrial canals.)

Eventually, the Mississippi Delta, where sediments from 41 states once settled to form the vast wetlands of southern Louisiana, became one of the most engineered deltas in the world.

By the 1950s, however, Gilbert F. White, a geographer then at the University of Chicago, and his colleagues were studying the shortcomings of the “structural” approach to floods.

White disagreed with the prevailing ideas that engineers could solve all flooding problems. He concluded that structural projects—levees and floodwalls, for instance—entice unsuspecting residents and businesses into vulnerable areas. Over decades, many local people tend to forget the presence of levees and beach nourishment projects, believing that they are living in places without special dangers. Then, one day, a flood or coastal storm overwhelms the design limitations of engineering projects, just as Katrina did.

Says Burby, “That’s when you end up in situations like New Orleans, where you get catastrophic failure of protective measures and get massive damages.”



NEW SOLUTIONS?

There must be a better way to manage floods than building hard structures to hold back rising water, White and his colleagues concluded. They proposed a policy of retreat from the most flood-prone areas, offering a menu of strategies: land-use planning and regulation, land acquisition, flood predictions and warnings, and, under some conditions, flood insurance.

After disastrous floods swamped the Midwest in the 1950s, Congress considered creating a government-sponsored program for flood insurance, but that idea went nowhere.

Then, in 1965, Hurricane Betsy struck the Gulf Coast, killing 75 people and causing \$1.4 billion in damage.



LESSON LEARNED. *This home, 200 yards from the Mississippi coast, survived Katrina's storm surge because ground-level walls broke away, preserving the elevated living area. Communities belonging to the federal flood-insurance program require that all new or substantially remodeled floodprone structures be elevated on pilings or tall foundations. Experts say that raised structures are far more likely to survive battering storm surges than those with foundations near ground level. PHOTO/WADE SPEEDS*

In short, property owners footed the bill of fixing up their own structures after a disaster, an expensive proposition, particularly for the poor. But the National Flood Insurance Program changed that, allowing millions of Americans to purchase a federally underwritten flood policy. A major benefit of the federal program was requiring new and substantially remodeled structures to be elevated high enough to escape rising water and pounding hurricane waves. "Adequately elevating a building is a critical issue in whether it's damaged or not during a flood," says Spencer Rogers, a coastal-hazards specialist with the North Carolina Sea Grant Program.

Flood insurance has become a crucial hedge against financial catastrophe for 4.7 million policyholders. About 90 percent of major U.S. disasters involve flooding, either from coastal storms or river overflows.

HAZARD MITIGATION

One more flood changed the direction (at least for a time) of federal policy: the Midwest Flood of 1993. Damaging more than \$12 billion worth of property along the Mississippi and Missouri rivers, it was the most expensive natural disaster in U.S. history for taxpayers at the time. One thousand

The storm also overwhelmed the levees protecting New Orleans from Lake Pontchartrain—just as Hurricane Katrina did in 2005. Betsy's storm surge dumped eight feet of water into the city.

Americans were once again moved by images of death and destruction. Political leaders called for new studies, which in turn recommended a fresh direction in federal policy, and in 1968, Congress created the National Flood Insurance Program.

In 1972—when South Carolina communities began adopting the flood-insurance program—most coastal residents had little reason to be concerned about over-development. Many South Carolina beach communities were dotted with unassuming

cottages. Towns and cities were compact. On the mainland, timber companies and hunting plantations owned mosquito-haunted lowlands, as did working men and women who couldn't afford to live anywhere else or who had generational ties to the land and sea. The wealthy built houses on bluffs above coastal rivers or along ridges of the sea islands.

For generations, if a home got flooded repeatedly, the owner was likely to abandon it and move upland. If a victim had enough money and optimism, he built a new house on a taller foundation to let water flow under the first inhabited floor. This architectural style can be found in many older homes of Charleston, Beaufort, and Georgetown.

levees failed, mostly north of St. Louis, and 60,000 houses and businesses were swamped.

But something good came out of that mess. "The federal government's response was one of the most enlightened we've had," says David R. Conrad, senior water-resources specialist with the National Wildlife Federation. "There was a blossoming of the idea called hazard mitigation. That is, how can you build safer?"

FEMA helped midwestern communities buy out and relocate 20,000 homes and businesses in more than 180 municipalities. In one famous case, the entire town of Valmeyer, Illinois (pop. 900), was relocated from the floodplain to a nearby bluff. This allowed the community to avoid repeated inundation from the Mississippi River.

FEMA officials argue that buyouts of land and structures on river floodplains are less expensive than allowing victims to receive

SPENCER ROGERS

*Adequately
elevating a building
is a critical issue in
whether it's damaged
or not during a flood.*

repeated insurance settlements and disaster assistance. Every dollar spent on riverine buyouts and elevations saves two to three dollars. But the cost of land on coastlines makes such buyouts impractical there.

Some communities have established comprehensive plans and passed tougher ordinances to manage development in vulnerable areas; purchased wetlands, floodplains, and other open spaces along waterways;

improved stormwater drainage systems; and steered public facilities and infrastructure outside of hazard areas.

Through the 1990s, the principle of hazard mitigation gathered momentum. FEMA established Project Impact, a partnership of local, state, and federal agencies collaborating to identify and improve vulnerable structures before a natural disaster strikes.

Since 2001, however, hazard mitigation became less of a priority in the federal government, says Conrad. "After the change of administrations, Project Impact was one of the programs that got eliminated."

Localities can still apply for hazard-mitigation grants from other FEMA programs, but the application process is more time-consuming and difficult than a decade ago, says Simmons of Charleston County.

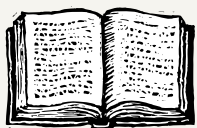
Meanwhile, many localities have returned to business as usual. "Citizens and their local officials both tend to misperceive their risk of loss due to hazards," says Burby. "As a result, there's not much political demand for hazard mitigation and not much political action either, particularly before the community has created a hazards problem by allowing development in hazardous areas."

SYSTEM NEEDS OVERHAULING

The flood-insurance program is financially broken today because its premiums haven't kept pace with flood risks exacerbated by recent hurricanes. According to the Government Accountability Office (GAO), Congress has not allowed FEMA to raise financial reserves required to cover catastrophic losses like those of 2005. Congress has limited flood-insurance rate hikes to 10 percent annually.

In Oct. 2005, David Maurstad, acting director of FEMA's mitigation branch, told the U.S. Senate Banking Committee that the flood-insurance program should be changed. Katrina and Rita caused 225,000 claims of flood damage to residential and commercial property, which will cost an estimated \$23 billion. Over the program's history, since 1968, combined claims have

READING AND WEB SITES



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Association of State Floodplain Managers
www.floods.org

FEMA Flood Hazard Mapping
www.fema.gov/plan/prevent

Insurance Information Institute
www.iii.org

South Carolina Flood Mitigation Programs
www.dnr.sc.gov/water/envaff/flood/scnfp.html

NOAA Coastal Services Center Coastal Storms Program
www.csc.noaa.gov/csp

totaled \$15 billion. The program collects \$2 billion in premiums each year, so taxpayers and policyholders will have to make up the difference.

"The flood-insurance program is now, so to speak, underwater," says Jerry Johns of the Southwestern Insurance Information Institute. "Rates are going to be significantly increased."

Maurstad argues that all flood policyholders should be charged "fair and actuarially sound premiums," and this should be done largely by phasing out the most obvious subsidy to property owners. That is, discounts of about 60 to 70 percent are given to owners of older structures that were built before federal flood insurance was offered in their communities.

About 1.3 million older structures (many built before the mid-1970s) receive subsidized insurance rates. The total value of this subsidy is an estimated \$1.3 billion per year, according to the GAO. Eliminating the subsidy could eventually push up premiums in some historic areas and older neighborhoods along the South Carolina coast, but it could bring the flood-insurance program closer to long-term financial health.

Congress should also increase mandatory participation in the flood-insurance program well beyond the 100-year flood-hazard zone, according to the Insurance Information Institute, a trade group of private insurers. Today, all lenders require that every mortgage holder nationwide buy standard homeowners insurance. The same principle should be expanded to flood insurance, according to the institute.

The U.S., meanwhile, is likely to face years of intense hurricane activity in the North Atlantic. Since 1995, the North Atlantic has seen an upswing in the number of hurricanes, which could be part of a weather trend lasting decades, researchers say.

It seems likely that a number of coastal residents will not have learned the lessons of the record-shattering 2005 hurricane season, with 27 named storms. That is, the next time a major storm strikes the U.S. coast, some Americans will be shocked that they've been living in a flood-prone area and never knew it. ♡



COASTAL WETLAND LOSS THREATENS SOME REGIONS

Coastal beaches and marshes are moving inland, inch by inch in many places, though in a few places they are traveling mile by mile, particularly during huge storms.

A warming climate has pushed up mean sea level four to eight inches worldwide over the past century. As a rule of thumb, a one-foot rise in sea level in the U.S. Southeast can translate into 100 feet of shoreline retreat, all other factors being equal. When beaches and marshes retreat, existing coastal buildings are more vulnerable to hurricane surges and battering waves.

Computer models suggest that the rate of sea level rise will accelerate, according to a 2001 report of the U.S. Global Change Research Program, *Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change*. Global sea level is projected to rise an additional 19 inches along most of the U.S. coastline by 2100.

In some places, rising sea level is killing salt marshes by flooding them constantly so they never dry out. When vegetation dies, soils disperse and the wetland becomes open water.

Coastal marshes are disappearing along portions of New England, San Francisco Bay, and the Columbia River estuary in Washington state.

The most dramatic losses have been in south Louisiana's marshes and barrier islands, which once helped buffer the city from giant storms. An average of 34 square miles of coastal land, primarily marsh, has disappeared per year for the past 50 years in coastal Louisiana, according to the U.S. Geological Survey. Today, 50 acres a day are lost.

The Mississippi River used to overflow periodically across the delta, allowing huge quantities of silt to settle and nourish wetlands and barrier islands. But during the 1930s, in an effort to make waterways safer for navigation and flood control, engineers extended levees for some 2,000 miles along the banks of the Mississippi River and its tributaries. Levees have protected communities from river flooding, but they have also caused most of south Louisiana's land loss, scientists say.

Walled off from the floodplains, the Mississippi River can no longer provide enough silt to south Louisiana's delta to keep up with natural subsidence and relative sea level rise. Most of the silt is lost because the river's flow runs between levees and jetties straight into the deep waters of the Gulf of Mexico.

By contrast, South Carolina and many other states in the southeastern U.S. are fortunate to have coastal wetlands continuously fed by river sediments.

"In South Carolina, we have big muddy rivers, so we don't currently have a problem with sediment supply," says James T. Morris, a marine scientist at the University of South Carolina. ♡



ONWARD AND UPWARD. *On the Isle of Palms, an older home (right) sits next to one built after the municipality joined the National Flood Insurance Program. This program, analysts say, subsidizes coastal development, but it also encourages new homes to be elevated above rising water, potentially reducing flood costs.* PHOTO/WADE SPEES

DOES FLOOD INSURANCE ENCOURAGE DEVELOPMENT?

Hurricane Katrina's damages were so costly partly because flood insurance in some vulnerable locations is too cheap, some experts say.

Most flood-insurance policies are quite inexpensive, a "great bargain" for individual property owners, says Raymond Burby, a professor of urban and regional planning at the University of North Carolina at Chapel Hill. This bargain, Burby adds, has inadvertently stimulated development in vulnerable places and led to immense economic damages during hurricanes and floods.

The average flood-insurance premium is about \$400 for a single-family home. "Especially in coastal areas, artificially low flood-insurance premiums are a subsidy and encourage people to live where natural disasters are likely to occur," writes David C. John, a research fellow with the Heritage Foundation, a conservative think tank based in Washington, D.C.

Robert Becker, director of Clemson University's Strom Thurmond Institute of Government and Public Affairs, says, "The National Flood Insurance Program has

been a major policy fiasco. It has allowed houses that would not normally have been built in the floodplain to be built."

The Federal Emergency Management Agency (FEMA), which administers the flood insurance program, has created an unrealistic measure of financial certainty in environments particularly vulnerable to natural disasters, says Becker. Because of federal flood policies, lenders can profitably offer mortgages that they would otherwise find far too risky.

Soon after flood insurance became available in South Carolina in 1972, Becker points out, people almost immediately flocked to the coast, building suburban-style homes near the water. And because so many Americans love the waterfront, rising demand drove up coastal property values, making these areas more attractive to speculators. Real-estate investors bought land to build condos, high-end vacation rentals, and golf-course communities.

"The federal flood insurance program created an acceptable risk threshold for people to move into coastal

areas,” says Becker, “and that allowed us to be careless.”

Flood insurance rewards intensive development in hazardous areas by greatly reducing risks for both lenders and property owners, according to Rutherford Platt, a professor of geography and planning law at the University of Massachusetts.

Over the past 30 years, major hurricanes have been almost always followed by accelerated coastal growth. Many victims have used insurance payouts and disaster assistance to replace modest homes along beaches and salt marshes with significantly bigger, more expensive structures. Says Gregory Stone, a coastal engineer at Louisiana State University, “We have become lazy and apathetic about the entire problem of coastal development.”

FEMA does not force land-use planning and regulation on local communities. The federal agency does, however, establish minimum requirements for local communities that belong to the flood-insurance program — rules that are supposed to be enforced within the building-permit process. In other words, FEMA does not press for local regulations on where people can build but only how they can build.

Congress originally created flood insurance in an effort to encourage Americans living in flood-prone areas to raise their homes. New and substantially remodeled homes in floodplains must be elevated on pilings or tall foundations, which can protect them from flood damage. The program also provides incentives to strengthen existing structures against wind damage. According to flood-insurance officials, FEMA’s efforts have saved the nation an estimated \$1 billion a year in flood costs.

“The federal government has no authority to tell you or me how high to build our houses,” says Spencer Rogers, coastal-hazards specialist with the North Carolina Sea Grant Program. “That’s a state’s right, and the only way that Congress could get involved was to invent flood insurance. The federal government used flood insurance as a carrot, offering it to everyone in town

to get the elevation requirement implemented for all new construction.”

The flood-insurance program has had a positive effect on new coastal development, he says, in that its incentive to raise buildings has made a major difference in whether those structures survive floods.

The limitation of this approach, though, is that few coastal states and localities have done nearly enough to plan and regulate where development should be located to avoid natural hazards, says Burby.

MANY FACTORS

Did federal flood insurance—by itself—draw people to the South Carolina coast? No, but flood insurance in combination with other incentives likely encouraged some to move here.

After the long economic boom following World War II, more Americans were flush with money, which allowed them to travel to beach resorts or retire near the water. The southeastern coast was also a cheap place to live—and it’s still cheap compared to other U.S. coastal areas. Air-conditioning became more widely available and affordable in



RAISING THE BAR. Charleston County requires that contractors add an extra foot of elevation to new structures, raising the first inhabited floor even higher than flood maps indicate is necessary, says Carl Simmons, county building official. This measure can mitigate future flood costs. PHOTO/WADE SPEES

the South’s humid climate.

Federal spending linked interstate highways from inland and northern cities to the South. Some shorelines were artificially plumped up with sand, and nourishment projects, largely federally funded, have continued. Road projects also allowed suburbia to spread rapidly from coastal cities across flood-prone watersheds. As a result, more households could live in single-family homes with yards not far from sandy beaches, salt marshes, and creeks.

After hurricanes, federal disaster assistance has allowed income-tax write-offs for damaged property and low-cost loans to businesses. Resulting skyrocketing land values along the coast have stimulated further investment.

Much of this investment would not be possible without federal flood insurance, however. The federal government has backed a form of insurance that is unavailable from private insurance companies.

Yet flood insurance is not at the top of most people’s minds when they decide to move to the South Carolina coast. Why? Perhaps because flood insurance has become part of the coast’s social and economic landscape. In effect, it has become an entitlement program that people expect to continue.

For a single-family home, a flood-insurance policy is limited to \$250,000 on the structure and \$100,000 on personal belongings. Therefore, the policy alone isn’t enough to encourage construction of a million-dollar home on the coast.

Some experts are skeptical that flood insurance has had a dramatic impact on coastal development. Americans have also flocked to coastal communities that don’t belong to the federal flood-insurance program, Rogers notes.

So how does flood insurance compare to other factors that encourage unwise coastal development? No one really knows, concluded the U.S. Commission on Ocean Policy.

The commission’s Nov. 2004 report, however, points out that while market forces make shorelines attractive for investment, “flood insurance also plays a role” in facilitating “inappropriate coastal development and redevelopment.”

NEWS & NOTES

Prehistoric rivers potential sites of beach-quality sand

Rising sea level over thousands of years drowned South Carolina's ancient river valleys and beaches, locking potentially valuable sources of sediment, including beach-quality sand, under water.

Now, scientists are identifying where these ancient channels and beaches are located on the inner continental shelf from the North Carolina state line to Winyah Bay. Finding ancient river valleys could make it easier to locate high-quality sand, which could be used to nourish some of South Carolina's eroding beaches.

"We've identified big river channels and estimated their ages," says Wayne Baldwin, a geologist with the U.S. Geological Survey Woods Hole Science Center in Woods Hole, Mass. "We have a good idea that there was much more sand in the Grand Strand system at one time."

Baldwin and his colleagues have discovered that hundreds of thousands of years ago a river system flowed into the sea in what is now the North Myrtle Beach area. But, over millennia, the river system's outlet migrated south along the shoreline, eventually arriving at Winyah Bay.

This information increases scientists' understanding of how the coast has evolved over thousands of years. In particular, it outlines a major change in the way that sediments have been supplied to the region's beaches and the inner continental shelf.

Today, the Grand Strand lacks significant sand resources. Ancient rivers once supplied great quantities of sediment to the Grand Strand from the Blue Ridge Mountains and the Carolina piedmont, but now the amount of those materials has decreased.

Most of the sediment load in the Pee Dee River system becomes

underwater, renourishment, and eventually materials coming from the inner shelf," which circulate seasonally onto the beach, says Gayes.

Baldwin and Gayes' research is part of the South Carolina Coastal Erosion Study, which began in 1994, and is a cooperative effort of the S.C. Sea Grant Consortium and



PHOTO/WADE SPEES

trapped behind dams upstream, or deposited in the Winyah Bay estuary, or transported by longshore ocean currents out of the Grand Strand system. Coastal currents generally push sand south from Winyah Bay.

Along much of the Grand Strand, "we're starved for sediment," says Paul Gayes, director of the Burroughs & Chapin Center for Marine and Wetland Studies at Coastal Carolina University, Baldwin's co-investigator.

"Our sources of sediment are erosion of older land surfaces

the U.S. Geological Survey. Project information can be viewed at the Web site camelot.coastal.edu.

"The Coastal Erosion Study examines how the coast works as part of a larger system," says Gayes. "The study is a regional, comprehensive assessment on various time scales that helps explain how the coastal system has evolved."

The study's first phase, completed in 1999, focused on a preliminary surveillance of the mid-section of coastal South Carolina.

The second phase, begun in 2000, involved studies of the

NEWS & NOTES

northern portion of the South Carolina coast, examining the behavior of the beach environment in short- and long-time periods. Employing geophysical surveys and repeated beach profiles, and developing and applying innovative technologies such as high-resolution sonar imagery, the scientific team is aiming to establish a “sand budget” for the coastal region.

More recently, study scientists are also using computer models to simulate the waves and currents and other coastal processes that shape the locations and amount of sand resources on the continental shelf. Once researchers develop the computer models to accurately portray physical conditions along the coast, then they can better predict erosion and other beach processes.

“Even the casual observer can see that sediment moves on the beach,” says S.C. Sea Grant researcher George Voulgaris, a physical oceanographer/geologist at the University of South Carolina. “The numerical model work currently underway aims at understanding exactly when and under what combinations of waves and currents does the sediment move, plus the direction and quantities of the sediment that are transported. Only when we have this information will we be able to predict the location and rate of erosion or accretion along the coastline.”

Scientists are employing sophisticated technology and a broader geographic approach to gain knowledge of regional coastal systems. “The integrated approach of the Coastal Erosion Study has been a big step toward an improved understanding,” says Gayes. “The study provides a regional comprehensive look at the

coast’s framework—how the coastline was developed, followed by an examination of physical behavior of the beach, and measuring and developing numerical models.”

Scientists involved in the project represent Coastal Carolina University, College of Charleston, Clemson University, University of South Carolina, Skidaway Institute of Oceanography, Georgia Southern University, Scripps Institute of Oceanography, and State University of West Georgia.

Additional partners include the U.S. Geological Survey, S.C. Department of Health and Environmental Control-Office of Ocean and Coastal Resource Management, Mineral Management Services of the U.S. Department of the Interior, Offices of the State Geologist in South Carolina and Georgia, S.C. Department of Natural Resources Marine Resources Division, and Georgia Department of Natural Resources. ✓

COSEE–SE renewed for five years

The Center for Ocean Sciences Education Excellence–SouthEast (COSEE–SE) has been awarded \$2.5 million over the next five years to continue advancing ocean-sciences education in North Carolina, South Carolina, and Georgia. The National Science Foundation, with support from the NOAA Coastal Services Center, is providing funding for the regional center.

As part of the COSEE network of 10 centers across the United

States, COSEE–SE provides opportunities for collaborations among scientists and educators to advance ocean discovery and to educate students about the vital role of the oceans in our lives.

Each COSEE fosters interactions among ocean-science research institutions, formal education organizations, and informal education providers such as museums. COSEE centers, moreover, develop and disseminate educational materials on ocean-science research and education. More information is available at www.sceagrant.org/se-cosee. ✓

Group to continue coordinating ocean observations

The S.C. Sea Grant Consortium has been awarded \$1.14 million over three years from the NOAA Coastal Services Center to expand its efforts in coordinating the development of the Southeast Coastal Ocean Observing Regional Association (SECOORA). SECOORA’s footprint is the coastal and ocean environment from North Carolina through Florida. It is one of 11 regional associations spanning the country established to organize regional efforts in support of the U.S. Integrated Ocean Observing System (IOOS). Through a network of observations, IOOS systematically acquires and disseminates data and information on past, present, and future states of the oceans and U.S. coastal waters. More information can be found at www.secoora.org and www.ocean.us. ✓

EBBS&FLOWS

Society for Conservation Biology 20th Annual Meeting: Conservation Without Borders

*San Jose, California
June 24-28, 2006*

The 2006 meeting aims to transcend real and perceived boundaries of ecology, sociology, politics, and human behavior that impede conservation science and its application. Major topic areas will range from partnerships with private landowners to marine and freshwater conservation to transboundary conservation. For more information, visit www.ConservationBiology.org/2006.

National Marine Educators Association 2006 Annual Conference

*New York, New York
July 15-23, 2006*

Mark your calendars for the 2006 National Marine Educators Association Conference and encourage your colleagues to do the same. The NMEA conference is an opportunity for professional development for science educators everywhere and should not be missed. Field trips include boat trips, kayaking, scuba diving, New York Aquarium, American Museum of Natural History, Lamont Doherty Geological Laboratories, and others. For complete conference information, check the Web site at www.NYSMEA.org.

9th International Conference on Shellfish Restoration

*Charleston, South Carolina
November 15-19, 2006*

This conference will provide an opportunity for resource managers, scientists, shellfishermen, and community leaders to exchange ideas and information on restoring molluscan shellfish populations while improving water quality and the environmental health of our estuarine and coastal systems. Those interested in participating should contact Elaine Knight via e-mail at Elaine.Knight@scseagrant.org. If you would like information on submitting an abstract, contact Rick DeVoe at Rick.Devoe@scseagrant.org. For more information, visit www.scseagrant.org/icsr.htm.

ATTENTION SCHOOL TEACHERS! The S.C. Sea Grant Consortium has designed supplemental classroom resources for this and past issues of *Coastal Heritage* magazine. *Coastal Heritage Curriculum Connection*, written for both middle- and high-school students, is aligned with the South Carolina state standards for the appropriate grade levels. Includes standards-based inquiry questions to lead students through explorations of the topic discussed. *Curriculum Connection* is available on-line at www.scseagrant.org/education.htm.

Subscriptions are free upon request by contacting: Annette.Dunmeyer@scseagrant.org



287 Meeting Street
Charleston, S.C. 29401

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